

CLAIMS

What is claimed is:

1. An isolated metalized protein polymer wherein the polymer is coated with a single metal species.
- 5 2. The isolated metalized protein polymer of Claim 1 wherein the protein polymer is selected from the group consisting of actin fibers, intermediate filaments, fibrin, collagen fibers, silk proteins, elastin, bacterial coat proteins, microtubules, avidin, streptavidin, immunoglobin binding protein, immunoglobins, and receptor proteins.
- 10 3. The isolated metalized protein polymer of Claim 2 wherein the protein polymer has an aspect ratio greater than 10.
4. The isolated metalized protein polymer of Claim 3 wherein the protein polymer is tubular in structure.
- 15 5. The isolated metalized protein polymer of Claim 4 having a length of 10 microns or less, having an external diameter of about 4 nm to about 30 nm and having an internal diameter of about 0 nm to about 20 nm.
6. The isolated metalized protein polymer of Claim 5 wherein the protein polymer comprises tubulin.
- 20 7. The isolated metalized protein polymer of Claim 1 wherein the coating of the protein polymer is interrupted.
8. The isolated metalized protein polymer of Claim 1 wherein the coating of the protein polymer is continuous.
- 25 9. The isolated metalized protein polymer of Claim 1 wherein the single metal species is selected from the group consisting of gold, silver, platinum and palladium.
10. An isolated microtubule wherein the microtubule is continuously coated with gold.
- 30 11. A process for the synthesis of a metalized microtubule comprising:
 - a) providing a population of microtubules;
 - b) fixing the microtubules of (a) with a fixative whereby the fixative binds to the microtubules;
 - c) removing unbound fixative;
 - 35 d) reacting the fixed microtubules of (c) with at least one reducible metal salt in the presence of a reducing agent

wherein the microtubules are coated with the reducible metal of the metal salt to form a metalized microtubule.

12. A process according to Claim 11 wherein the metalized microtubule is optionally isolated after step (d).

5 13. A process according to Claim 11 wherein step (d) is repeated one or more times to enhance metal coating with the same or different metal.

10 14. A process according to Claim 11 wherein the removal of unbound fixative is accomplished by a method selected from the group consisting of dilution, washing, dialysis, centrifugation, and separation.

15. A process according to Claim 11 wherein the population of microtubules are immobilized on a solid support.

16. A process according to Claim 11 wherein the population of microtubules are in suspension.

15 17. A process according to Claim 11 wherein the solid support is selected from the group consisting of a nickel grids, nickel disks, silicon wafers, carbon supports, aminosilane-treated silica and polylysine coated glass.

20 18. A process according to Claim 11 wherein the metalized microtubule of step (d) is optionally immobilized on a solid support.

19. A process according to Claim 18 wherein the solid support comprises a material selected from the group consisting of nickel, silicon, carbon, substituted polystyrene, agarose, nitrocellulose, nylon, aminosilane-treated silica and polylysine coated glass.

25 20. A process according to Claim 11 wherein the fixative acts to cross-link the microtubules.

21. A process according to Claim 11 wherein the fixative is selected from the group consisting of di-aldehydes, keto-aldehydes and di-ketones.

30 22. A process according to Claim 11 wherein the unbound fixative is removed by a process selected from the group consisting of dilution, washing, dialysis, centrifugation, separation, and quenching.

23. A process according to Claim 11 wherein the reducible metal salt is selected from the group consisting of salts of the metals selected from the group consisting of gold, silver, platinum and palladium.

24. A process according to Claim 23 wherein the reducible metal salt is selected from the group consisting of HAuCl₄, AgNO₃ H₂PtCl₆, and K₂PdCl₄.

25. A process according to Claim 11 wherein the reducing agent is selected from the group consisting of NaBH₄, and sodium ascorbate.

26. A process according to Claim 11 wherein the reaction of (d) is optionally terminated before the reaction runs to completion.

27. A conductive interconnect comprising the metalized protein polymer of Claim 1.

10 28. A metal nano-wire produced by a process comprising sintering the metalized protein polymer of Claim 1.

29. A method of producing a nano-wire comprising sintering the metalized protein of Claim 1.

30. A metal nano-wire produced by a process comprising gold enhancing the metalized protein polymer of Claim 1.

15 31. A process of producing a nano-wire comprising gold enhancing the metalized protein of Claim 1.